Science, Technology, and Innovation Committee

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Date: September 13, 2022
To: Alaska Bycatch Review Task Force (ABRT) Members
From: Tommy Sheridan
Subject: ABRT Research Priorities

The ABRT Science, Technology, and Innovation Committee (hereafter referred to as the "Science Committee") received and reviewed research recommendations from the three ABRT species committees on September 1, and the following document reflects their work.

This document identifies specific research to better understand the issue of bycatch and determine if and how to better leverage available resources. It addresses the third task identified in Administrative Order (AO) 326 which is to, "*Ensure state agencies are leveraging available resources to better understand the issue of bycatch."*

All committees agreed the three General Recommendations listed below are critical to the long-term success to *conducting and funding* the suggested and necessary research. Some examples on ways to implement the recommendations were provided and are listed.

(The Science Committee suggests these General Recommendations be listed upfront in the final report.)

Statement*: Research is the key to continued understanding of the impacts of bycatch and improvements in reducing bycatch. Generous funding is the key to support new and continuing research projects.*

GENERAL RECOMMENDATIONS FOR DEVELOPING RESEARCH PRIORITIES

1. Develop state bycatch research priorities, to share with funding entities that would help identify and acquire research funds.

2. Implement strategies to encourage and facilitate industry/agency cooperation research to reduce bycatch and associated mortality.

3. Create method for collaboration with other research entities to better track proposed or funded bycatch research, along with developing opportunities for cooperative projects and combined reporting of findings.

Implementation examples:

   a. *ADF&G could create a process where industry, communities, and tribes could participate in developing bycatch research priorities from the state's perspective.*

b. Encourage a more streamlined industry cost recovery process for proposed industry/agency projects.

c. Host an annual workshop between agencies, research entities and industry to better collaborate on proposed bycatch research projects.

Research recommendations:

This section seeks to address the first task in AO 326, which is, "*Study what impacts bycatch has on fisheries."*

Committee discussions highlighted the difficulty in identifying research that is strictly bycatch focused. Most agreed that there were clear research needs to reduce bycatch, but there is also a need to improve our understanding of the target species in order to identify impacts to those species from bycatch. Gaps were identified that need to be addressed for managers to more fully understand and assess what impacts bycatch may be having on some fisheries.

All of the committees made three specific recommendations which span regions and gear groups:

1. **Gear modifications/improved technology:** One of the areas that was bycatch focused and extended across areas and species was the need for gear research. Research such as salmon excluder work, pot modifications and use of technology in identifying "hot spots" was discussed. This area requires collaboration with industry and would benefit from agency support. Regulatory action may be appropriate when gear modifications prove to be effective in reducing bycatch.

   Recommendation: Fund and support gear modification research for all gear types to reduce incidental take of Chinook and chum salmon, crab, and halibut, as well as discard mortality.

2. **Update assumed discard mortality rates:** Assumed discard mortality rate studies, which inform stock assessments and other management measures, are outdated, and may not reflect current industry technology and handling practices.

   Recommendation: Discard mortality rate studies are needed in all regions, species, and gear groups.

3. **Shifting distribution patterns:** Data is necessary for determining the shifts in distribution patterns with the changing climate. Both salmon and crab stocks have experienced shifting distribution patterns and it is critical to understand these patterns, both temporally and spatially, to ensure the best information is being used when developing bycatch mitigation measures.

   Recommendation: Additional survey work is needed, along with tagging studies for crab and halibut.

SPECIFIC RECOMMENDATIONS BY SPECIES

Salmon Research

Much of the salmon research identified was similar for both the Bering Sea (BS) and the Gulf of Alaska (GOA) regions. Listed below is the research identified for Western Alaska salmon, and research which is unique for the GOA.

Western Alaska Salmon

Research Goals:

- Research to improve our ability to determine the stock of origin for chum and Chinook salmon taken as bycatch.

- Research to reduce bycatch through improved understanding of distribution and migration of Western Alaska (WAK) chum and Chinook salmon stocks migration patterns to better predict and therefore avoid bycatch "hot spots" in the BS region.

Two areas of research were identified:

1. **Research that helps us understand the relative importance of particular mechanisms for driving abundance of Western Alaska Chinook and chum.**

   Studies that help us understand the relative role of marine interceptions and bycatch.

   a. **Improved information on marine migration patterns and its relation to fishery locations and timing.** Identified and recommended studies include:

      i. Alaska Fisheries Science Center (AFSC) presentations highlighted the work that ADF&G (for Chinook salmon) and NOAA (chum salmon focus) are leading in the Bering Sea through a project titled "*Model ocean distribution and migration of AK Chum and Chinook salmon stocks in the Bering Sea to predict distribution and hotspots."*

      ii. The committee recommends tagging studies of immature chum salmon throughout the North Pacific Ocean (NPO) to determine stock origin, destination, timing, and maturity.

      iii. The committee recommends a synthesis of marine migration information for NPO salmon stocks from fishery-dependent data sources, marine surveys, and tagging studies, to discern how these patterns may have changed with a changing climate.

   b. Improved information on the characteristics of fishery catches.

i. There are still improvements that can be made in the ability to assess age, and specifically stock-specific age of Chinook and chum salmon caught in any marine fisheries.

c. Improved information to help understand fishery impacts.

i. Improved adult-equivalency (AEQ) modeling through 'stock-specific' Chinook and chum salmon bycatch studies. Particularly for WAK chum salmon, AEQ analyses are limited by:

a) Age classification data gaps in adult chum salmon abundance across all of the WAK stock reporting groups. Studies that improve the ability to estimate abundance of all chum salmon in the WAK stock reporting group are limited. Continued genetics work is needed.

b) And/or the ability to break up the WAK reporting group. This might be remedied by using technologies that go beyond genetic assignment alone (i.e., use of pathogens, stable isotopes, etc.).

2. **Research that can provide an additional (non-adult) abundance estimate.**

Developing the ability to identify which life stages are most important for determining productivity for WAK salmon stocks is paramount; the committee recommends that research span the entire life cycle for all WAK salmon species.

a. Understand critical survival periods for WAK salmon through integrated ecosystem assessment surveys, including expansion of the northern Bering Sea (NBS) pelagic trawl survey into the near shore waters north of the Yukon River, including Norton Sound.

i. Similar research is being planned for the southern Bering Sea to have a more comprehensive assessment of WAK Chinook and chum salmon stocks.

NOTE: Neither of these projects are funded beyond 2023.

ii. Ecosystem indicators of interest and need include: summer sea temperature and resulting phytoplankton/zooplankton community structure; salmon and pelagic fish catch per unit effort; fish distribution; energy density for fitness; fish size; and stomach content analyses. These indicators are being utilized to understand climate impacts on the NBS ecosystem and resulting fish fitness and survival. Results from recent NBS pelagic trawl surveys suggest that the marine heat wave within the NBS during 2016 to 2019 negatively affected juvenile chum salmon fitness due to a shift to low quality prey, and increased metabolic rates due to higher sea surface temperatures, likely leading to high winter mortality. Similar data suggest that Chinook salmon abundance is negatively impacted by factors inherent to freshwater and early marine residence.

b. Studies that help understand how ocean/climate conditions impact future runs.

i. Marine pelagic trawl surveys in the northern and southern Bering Sea can help us address this (see above).

ii. NOAA and ADF&G are collaborating through International Year of the Salmon (IYS) to utilize project results to examine immature AYK chum salmon in the NPO during winter (**this is not yet funded**).

iii. Immature salmon surveys (like the IYS surveys) in the Bering Sea and North Pacific Ocean are necessary **(there is currently no funding support for charter vessels to conduct such surveys, nor for collecting and processing samples or paying for gear and supplies).**

c. Studies that help us understand the role of diet, health and disease on the survival and spawning success of Western Alaska (WAK) Chinook and chum salmon are necessary, including:

i. Understanding vectors of Ichthyophonus infection for Yukon River Chinook salmon, including identifying when and where it contributes to salmon mortality during their spawning migration.

ii. Understanding diet, nutrition, and condition of WAK Chinook and chum stocks at juvenile (marine pelagic trawl surveys in the northern and southern Bering Sea – see above), immature (IYS surveys, industry catches, etc.), and adult life stages (i.e., samples from lower river test fisheries). **Pilot work is underway for Yukon River Chinook salmon, but is only funded through 2022.**

(Above research is applicable to the Gulf of Alaska, but items below are highly specific to Gulf of Alaska Chinook salmon.)

<u>Gulf of Alaska Chinook Salmon</u>

<u>Committee Recommendation:</u> Conduct annual genetic and spatial assessment of Gulf of Alaska (GOA) Chinook salmon.

<u>ADF&G Priorities:</u>

1. Studies that help us understand the relative role of marine interceptions and bycatch are necessary.

a. Improved information on marine migration patterns and its relation to fishery locations and timing. Extend the distribution and timing of projects using bycatch data in the Bering Sea to include the western GOA.

b. Improved demographic information that will enable assessment of stock-specific impacts.

i. Collect samples to improve demographic information such as stock, age, sex, size and maturity for Chinook and chum salmon caught in any marine fisheries.

ii. Improved information to help understand fishery impacts through AEQ or similar analyses.

2. **Research that can provide an additional (non-adult) abundance estimate. This is powerful for helping triangulate which life stages are most important for determining productivity.**

   a. Juvenile salmon surveys – a survey occurs annually in the eastern GOA to monitor Southeast Alaska (SEAK) salmon stocks (NOAA's Southeast Coastal Monitoring project, or SECM).

      i. ADF&G will pilot a juvenile salmon survey in the western Gulf of Alaska in 2023. This will align with surveys in the northern and southern Bering Sea and SEAK to give a comprehensive assessment of Alaska Chinook and chum salmon early in the marine life stage.

      NOTE: Neither the GOA nor the Bering Sea projects are funded beyond 2023.

3. **Studies that help us understand how ocean/climate conditions impact future runs.**

   a. Marine pelagic trawl surveys in the Bering Sea and GOA (including western/central Alaska and SEAK surveys).

   b. Immature salmon surveys (like the IYS surveys) in the Bering Sea, GOA, and NPO.

Crab Research

Following are bycatch research recommendations specific to crab in all regions of the state, with projects listed to address the issue.

1. **Address observed and unobserved mortality caused by gear interactions:**

   a. Study the impacts of repeated capture/discarding of females, sublegal and legal males;

   b. Assumed discard mortality rates should be studied and updated for all gear groups;

   c. Address data gaps regarding uncertainties in the directed crab fishery and unobserved state pot cod fishery;

   d. Research habitat disturbance utilizing tools such as the fishing effects model to study effects of bottom contact gear on mating and molting crab.

2. **Continued research on critical crab habitat to better inform open and closed areas for commercial fishing activity:**

    a. Conduct tagging studies and other research to determine seasonal crab movement and distribution;

    b. Work to improve understanding of preferred habitat at various life stages, including mating and molting timing and location;

    c. Examine Vessel Monitoring System (VMS) use in developing Essential Fish Habitat models and ways to improve this data.

Gulf of Alaska Tanner crab

Recommendation: Full retention of Tanner crab in all GOA trawl fisheries for a period of two years to better quantify removals was a recommendation that would require management measures and experimental fishery permits.

Halibut Research

Top Priority: Investigate better ways to estimate total removals and discard mortality.

Other issues identified by the Gulf of Alaska (GOA) Halibut and Salmon Committee:

1. Research GOA statistical areas to update/revise closed areas for trawling;

2. Impacts of fish gear types on halibut habitat;

3. Increase tagging studies to better understand movement between areas;

4. Investigate halibut diet and growth rate to better understand changes in length at age;

5. Studies on size limit and trade-offs (ongoing at International Pacific Halibut Commission, with report due in October 2022);

6. Determine relative fecundity of halibut based on size and age, and estimate impact on halibut stock of removals from all sources.

References

1. BSAI/GOA crab committee research recommendations

2. GOA halibut/salmon committee research recommendations

3. Western Alaska salmon committee research recommendations